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Detection of Moisture and Moisture Related
Phenomena from Skylab

Joe R. Eagleman
Principal Investigator

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During the month of October the efforts listed in the September report were continued. Most of these will require more work before they can be reported. We have made some progress in computing the effects of vegetation in weighting the antenna pattern of the S194 sensor and in analyzing the aircraft data. These will be reported in more detail next month except for a preliminary analysis of the aircraft data.

A preliminary soil moisture versus aircraft radiometric and scatterometric analysis has been completed for Mission 238, Flight 21, Flight Line 1, Run 2 (Texas site #369) on June 6, 1973. The procedures utilized in the analysis, the results, and the subsequent refinements deemed necessary to improve these results will be discussed.

Initially, the aircraft flight line (run 2) was adjusted via trigonometric analysis to reveal the true ground path intersected by the Radscat instrumentation. This operation refined the flight line by an average of 0.5 statute miles. This adjusted path was subdivided from record number 1-4200 into 42 equal intervals (100 points each). Average radiometric and scatterometric values were computed for each interval and then plotted at the geographic coordinate corresponding to the mid-

point of each respective interval. These values were subsequently correlated with a soil moisture map generated from ground truth data. As mentioned in the August report, these soil moisture maps incorporate a technique employing a weighted linear trend surface based on distance for weight and a least squares solution for each grid intersection. This analysis yielded respective correlations of 0.13 and 0.24 for the radiometric and scatterometric values versus soil moisture.

These low correlations may well reveal the significance which slope and vegetation exhibit upon the scatterometric and radiometric readings, respectively, taken by low flying aircraft. Subsequent investigation is being undertaken to determine the contributions of these two parameters to the radiometric temperature and scattering coefficient and to implement techniques to eliminate these effects. In addition an analysis of the data is being made for bare, flat fields only to see if this improves the correlation significantly.